

FUEL CELL SHUTDOWN AND STARTUP  
USING A CATHODE RECYCLE LOOP

ABSTRACT OF THE DISCLOSURE

A method and device for operating a fuel cell system. A  
recirculation loop coupled to a fuel cell cathode ensures that fluids passing  
5 through the cathode are recycled, thereby enabling reaction between residual  
oxygen in the recycled fluid and fuel that has been introduced into the  
recirculation loop until substantially all of the oxygen is reacted, leaving a  
substantially oxygen-free, predominantly nitrogen compound in the cathode  
and related flowpath. Thereafter, this compound can be redirected to purge  
10 the remaining residual hydrogen resident in the fuel cell's anode and related  
flowpath. While the present invention is usable during any period of system  
operation, it is especially valuable for operational conditions associated with  
starting up and shutting down a fuel cell system to inhibit the formation of  
high voltage potentials that could otherwise damage fuel cell catalysts or  
15 catalysts supports.